SCHEME OF INSTRUCTION & EXAMINATION
B.E. III-YEAR under AUTONOMOUS SCHEME
(MECHANICAL ENGINEERING)
AY 2017-18

Sl No.	Syllabus Ref .No.	SUBJECT	Scheme of Instruction Hours per Week				Scheme of Examination Duration in Hours	Maximum Marks		Credits
			L	T	D	P		Sem. End Exam	Sessi–onals	
SEMESTER – I										
THEORY										
1	ME3010	Dynamics of Machines	4	1	0	0	3	70	30	4
2	ME3020	Design of Machine Elements	4	1	0	0	3	70	30	4
3	ME3030	Manufacturing Processes	3	-	0	0	3	70	30	3
4	ME3050	Hydraulic Machinery & Systems	3	1	0	0	3	70	30	3
5	ME3110	Refrigeration & Air Conditioning	3	1	0	0	3	70	30	3
6	CE2090	Environmental Studies	2	-	0	0	3	70	30	2
7	HS3110	Finishing School-III (Soft Skills)	1	1	0	0	1½	35	15	1
8	ME3120	Finishing School-III (Technical Skills)	1	1	0	0	1½	35	15	1
PRACTICALS										
1	ME3011	Manufacturing Processes Lab	-	-	-	2	3	50	25	1
2	ME3021	Fluids & Hydraulic Machinery Lab	-	-	-	2	3	50	25	1
		TOTAL	**21**	**6**	**-**	**4**	**–**	**590**	**260**	**23**
		GRAND TOTAL	**32**					**850**		
SEMESTER – II										
THEORY										
1	ME3060	Machine Design	4	1	-	-	3	70	30	4
2	ME3070	Mechanical Vibrations	4	1	-	-	3	70	30	4
3	ME3080	CAD/CAM	3	0	-	-	3	70	30	3
4	ME3090	Machine Tools & Metal Cutting	3	0	-	-	3	70	30	3
5	ME3100	Heat Transfer	4	1	-	-	3	70	30	4
6	HS3140	Human Values and Professional Ethics-II	1	0	-	-	3	70	30	1
7	HS3210	Finishing School-IV (Soft Skills)	1	1	-	-	1½	35	15	1
8	IT2180	Finishing School-IV (Technical Skills)	1	1	-	-	1½	35	15	1
PRACTICALS										
1	ME3031	Dynamics of Machines Lab	-	-	-	2	3	50	25	2
2	ME3041	CAD/CAM Lab	-	-	-	2	3	50	25	2
3	ME3051	Machine Tools & Metal Cutting Lab	-	-	-	2	3	50	25	2
		TOTAL	**21**	**5**	**-**	**6**	**-**	**640**	**285**	**24**
		GRAND TOTAL	**32**					**925**		

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

DYNAMICS OF MACHINES

Instruction : 4+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3010
Credits : 4	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: 1. **identify** the forces involved in mechanisms and gyroscopic effects in vehicles. 2. **formulate** equations for rigid body dynamics. 3. **interpret** the cause and effects of unbalancing in machines. 4. **relate** forces and torque required to overcome friction in mechanical systems. 5. **show** the working principle of governors and flywheels in controlling speed of engines.	On completion of the course, the student will be able to: 1. **calculate** the gyroscopic couple and interpret its effect in designing engineering systems. 2. **solve** the rigid body dynamic equations. 3. **calculate** balancing masses required for rotating and reciprocating components. 4. **calculate** the forces and torque including friction in mechanical systems. 5. **calculate** the operational characteristics in Governor and design of flywheels.

UNIT-I

Static and Dynamic: Force analysis of 4-bar and slider crank mechanisms. Study of dynamically equivalent system, Inertia forces on connecting rod.

Gyroscope: Gyroscopic couple, gyroscopic effects in vehicles.

UNIT-II

Introduction to Rigid body dynamics: Basic concepts in 3-D rigid-body mechanics, Newton-Euler Equations, Formulation of equations of motion for inter-connected bodies

UNIT-III

Balancing

Forces due to rotating shaft carrying several masses in several planes. Rotary balancing on single plane and multiple planes, Shaking forces in single cylinder engine, Partial balancing of reciprocating masses. Balancing of multi cylinder in-line engines, V type engines and Radial engines.

UNIT-IV

Friction: Screw threads, pivots, collars, clutches

Brakes and Dynamometers: Block, band, block and band, internally expanding shoe brakes. Prony brake, rope brake, belt transmission, epicyclic gear transmission, torsion dynamometers.

UNIT-V

Governors: Classification of governors, Watt, Porter, Hartnell and Hartung governors, Controlling Force, Stability, Isochronism, Sensitivity, Power and Effort of governors.

Flywheels: Functions, Differences between flywheel and governor. Turning moment diagrams, flywheel analysis for I.C. Engines and Presses.

Learning Resources:

1. S.S. Rattan, *"Theory of Machines",* Tata McGraw Education Pvt. Ltd., New Delhi 2010.
2. Thomas Bevan, *"The Theory of Machines",* CBS Publishers & Distributors, 2004.
3. John J. Uicker, Jr., Gordon R. Pennock, Joseph E. Shigley, *"Theory of Machines and Mechanisms",* Oxford University Press, 2003.
4. R.L. Norton, "*Kinematics and Dynamics of Machinery*" Tata McGraw Education Pvt. Ltd., New Delhi 2009.
5. Ahmed A Shabana *"Dynamics of Multibody Systems"*, 4th ed, Cambridge University Press, 2013

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

DESIGN OF MACHINE ELEMENTS

Instruction : 4+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3020
Credits : 4	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to : 1. **understand** the stresses in machine members due to various types of loads and failure of components according to theories of failures. 2. **analyze** the components under variable loading for infinite and finite life. 3. **design** of machine elements under torsion, bending, axial loads and a combination of these. 4. **design** of various joints and fasteners for a given load to be transmitted. 5. **design** of various screws, rivited and welded joints.	On completion of the course the student will be able to: 1. **select** the proper material for the machine component based on theories of failure and estimate the factor of safety. 2. **determine** the sizes under different types of fatique loads and estimate the life of the components. 3. **calculate** the size of machine elements for transmitting torque, bending moment and axial loads. 4. **identify** the type of joints and fasteners required for a given application. 5. **predict** the type of failure and estimate the efficiency.

UNIT-I

Design considerations of Machine Elements. Materials used in machine design and their specifications according to Indian Standards. Codes and standards used in design. Important mechanical properties of materials used in design. Preferred numbers. Manufacturing considerations in design. Review of types of loads and simple stresses. Stresses due to Bi-axial and Tri-axial loads. Factor of safety. Theories of failures. Design of components subjected to impact loading.

UNIT-II

Design for Fatigue: Fluctuating stresses, fatigue strength and endurance limit Stress concentration factor and Notch sensitivity. Factors affecting fatigue strength. S-N diagram, Soderberg and Modified Goodman's diagrams for fatigue design. Cumulative fatigue - Miner's rule.

UNIT-III

Design of shafts: solid, hollow and splined shafts under torsion and bending loads. ASME code for design of shafts. Design of keys. Design of couplings - Muff, Split muff, Flange, Flexible, Marine type couplings. Design of pulleys and chain drives.

UNIT-IV

Design of Bolts, nuts & Joints: Design of Bolts and nuts, locking devices for nuts, bolts of uniform strength, bolted joints under eccentric loads.
Design of Cotter and Knuckle joints.

UNIT-V

Design of Screws: Design of power Screws and screw jack. Differential and Compound Screws.
Design of rivetted and welded joints under direct and eccentric loads.

Learning Resources:

1. M.F. Spotts, *"Design of Machine Elements"*, 7th edn., Pearson Edu, 2003.
2. V. B. Bhandari, *"Design of Machine Elements",* 3rd Edn., Tata McGraw- Hill Pub., 2010.
3. P.C. Sharma & D.K. Aggarwal, *"Machine Design",* 10th edn., S.K. Kataria & Sons, , 2003.
4. J.E. Shigley & Charles R. Mischke *"Mechanical Engineering Design",* 6th ed., Tata McGraw-Hill., 2010.
5. NC Pandya and CS Shah, *"Machine Design"* , Charotar publishing House, 2006.

Web Resources: http://nptel.ac.in/courses/112105124

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

MANUFACTURING PROCESSES

Instruction : 3 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3030
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: 1. **understand** casting process, materials and ingredients used for casting and its design. 2. **learn** the types of furnaces used for casting, different types of casting processes. 3. **explain** principles of Welding processes, Types of welding processes. 4. Become **familarized** with special welding processes and welding defects 5. **list** the types of forming processes, unconventional forming processes	On completion of the course the student will be able to: 1. **select** materials, types and allowances of patterns used in casting and molding. 2. **analyze** special casting processes and the equipment 3. **understand** the techniques of solid state and arc welding processes 4. **select** welding processes for special applications 5. **develop** process maps for metal forming processes using plasticity principles.

UNIT-I

Casting Process : Casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, riser and gating design.

UNIT-II

Special Casting Processes: Shell moulding, Co2 moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies, Inspection and testing of casting. Furnaces used in foundry-Cupola, Induction and Arc furnace.
Processing of plastics - Extrusion, Injection moulding, Blow moulding and Thermoforming.

UNIT-III

Welding Processes: Solid state welding processes - Friction welding, Forge welding, Explosive welding and ultrasonic welding, Gas welding, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Atomic hydrogen welding, Welding defects, principle of Soldering and Brazing.

UNIT-IV

Special Welding Processes: Laser beam welding, Electron beam welding, Thermit welding, and Electro slag welding. Resistance welding processes - Spot welding, Projection welding, Seam welding, Butt welding, weldability.

UNIT-V

Forming Processes: Cold & Hot working, Yield criteria, Process description of Forging, Rolling, Extrusion, Wire drawing, Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning. Introduction to unconventional forming processes-Explosive forming, Electro-magnetic forming, Electro-hydraulic and rubber pad forming.

Learning Resources:

1. P.N.Rao, *"Manufacturing Technology,"* Vol. 1, 3rd Ed., Tata McGraw Hill Publ., , 2011.
2. Amitabh Ghosh & Mallick, *"Manufacturing Science",* 4th Ed., Assoc. East west Press Pvt. Ltd., 2011.
3. Roy A. Lindberg, *"Materials & Process of Manufacturing",* 5th Ed., Prentice Hall of India, l992.
4. Serope Kalpakjian, *"Manufacturing Engineering and Technology",* Addison, Wesley Publishing Company, 2006
5. George.E. Dieter, *"Mechanical Metallurgy",* McGraw-Hill Book Company, 1988

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

HYDRAULIC MACHINERY & SYSTEMS

Instruction :3+1 Hours /week	Semester End Exam Marks :70	Subject Reference Code : ME3050
Credits : 3	Sessional Marks: :30	Duration of Semester End Exam :3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. **list** the effect of hydrodynamic forces on various types of vanes. 2. **describe** the working of reciprocating pumps and their performance. 3. **analyze** centrifugal pumps and their performance. 4. **compare h**ydroturbines and evaluate their performance. 5. **understand** basic concepts of hydraulic circuits and symbolic representation of various components.	On completion of the course the student will be able to: 1. **apply** fundamental knowledge to understand effect of hydrodynamic forces on various types of vanes. 2. **estimate** the performance and draw performance characteristics curves for reciprocating pumps. 3. **calculate** the performance of the centrifugal pump and draw characteristic curves. 4. **design** and **estimate** the efficiency of turbines with study of characteristic curves. 5. use the **knowledge** of different types of fluid control valves and apply to draw hydraulic circuits.

UNIT-I

Hydraulic Machines: Classification– Impulse momentum equation– Layout of hydraulic power plant – Working principle – Impact of jet on vanes – Force exerted by a jet striking and work done (i) a fixed flat vertical vane held normal to the jet flow (ii) At the centre of a fixed symmetrical curved vane (iii) At one end of fixed symmetrical and unsymmetrical curved vanes (iv) Flat vertical vane moving in the direction of jet (v) A series of flat vertical moving vanes (vi) At the centre of a symmetrical moving curved vane (vii) A symmetrical curved vane moving in the same direction as that of jet at inlet (viii) At one end of an un-symmetrical moving curved vane (ix) Hinged plate

UNIT-II

Reciprocating Pumps: Classification, working principle-single and double acting pumps-discharge, work done and power required to drive the pumps-slip, % slip and negative slip- variation of pressure head in the Suction and delivery pipes due to acceleration of piston- variation of pressure head due to friction in the suction and delivery pipes.

Indicator diagrams- Ideal and actual diagrams –Effect of piston acceleration and pipe friction on indicator diagram- Maximum speed at which the pump must run to avoid separation during suction and delivery strokes- Air vessels- Function of air vessels- Work saved by fitting air vessels to single and double acting pumps – Discharge of liquid into and out of air vessels- Performance characteristic curves.

UNIT-III

Centrifugal pumps: Classification – Working principle – Comparison over reciprocating pumps – Velocity triangles – Manometric head – Work done per second – Head equivalent of work done – Manometric, mechanical and overall efficiencies – Pressure rise in the impeller – Minimum starting speed – Specific speed – Physical significance of specific speed – Model testing – Conditions of similarity of CF pumps – Priming – Performance characteristic curves – Troubles (operational difficulties), reasons and remedies in CF pumps – Cavitation – Effects of Cavitation – Precautions against Cavitation.

UNIT-IV

Hydraulic Turbines: Classification of impulse and reaction turbines – Construction and working of Pelton wheels, Francis turbine and Kaplan turbine – Velocity triangles – Work done (power developed) – Hydraulic, Mechanical and Overall efficiencies – Maximum efficiency – Comparison between Impulse and reaction turbines – Comparison between Francis and Kaplan turbines – Specific speed – Physical significance of specific speed – Unit quantities – Model testing of turbines – Conditions for similarity of turbines – Draft tubes – functions and types of

draft tubes – Surge tanks – Functions and types of surge tanks – Performance characteristic curves.

UNIT-V

Industrial Hydraulics: Basic components of hydraulic circuits. Hydraulic oils: Properties and types of hydraulic oils; External Pumps: Working principles of external Pumps - gear, lobe, vane, radial piston and axial piston; Valves: Construction details and actuating methods of sliding spool directional control valves. Specification of D.C. valve; working of - flow control, pressure relief, pressure reducing and sequencing valves; Actuator and hydraulic motor: Working and construction details of single acting and double acting actuator and hydraulic motor; Symbolic representation of various components; Circuit for control of single & double acting actuators; Regenerative circuit; Speed control methods of actuators: meter-in, meter-out, and bleed off; selection criteria for pumps and actuators.

Learning Resources:

1. Bansal, R.K., *"A text book of Fluid Mechanics and Hydraulic Machines",* Laxmi Publication (P) Ltd., New Delhi, 2010
2. Modi, P.N., and Seth, S.M., *"Hydraulic and Fluid Machines",* Standard Book House, New Delhi, 2004
3. Ramamrutham, S.R Narayan, *"Hydraulics, Fluid Mechanics and Fluid Machines",* Dhanpat Rai & Sons, New Delhi, 2006
4. Kumar, K.L., *"Engineering Fluid Mechanics",* S. Chand Limited, New Delhi, 2008
5. Majumdar, S.R., *"Oil Hydraulic Systems – Principles and Maintenance",* Tata McGraw-Hill, 2004

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

REFRIGERATION & AIR CONDITIONING

Instruction : 3+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3110
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to : 1. **discuss** basics of refrigeration and air conditioning, compare the properties of refrigerants and analyze the air refrigeration& air craft refrigeration systems 2. **explain** the working of single stage and multistage vapour compression refrigeration systems. 3. **describe** the working of vapour absorption refrigeration system, steam jet refrigeration system, pulse tube refrigeration system, thermoelectric refrigeration system and solar refrigeration systems. 4. **describe** various principles of psychrometry 5. **estimate** the cooling loads of an air conditioned building, list different equipment used in air conditioning plant and learn different applications of R&A/C.	On completion of the course the student will be able to: 1. **classify** refrigerants and analyze the performance of air refrigeration and air craft refrigeration systems. 2. **solve** problems in vapour compression refrigeration systems and evaluate their performance. 3. **compare** VAR and VCR systems and **express** working principles various refrigeration systems. 4. **define** different properties of psychrometry and list different air conditioning systems. 5. **compute** cooling loads of an a/c building, identify different equipment used and explain different applications of Refrigeration and Air conditioning systems.

UNIT – I

Introduction to Refrigeration: Definition of Refrigeration and Air– conditioning –Necessity of Refrigeration and its applications – Methods of Refrigeration, unit of Refrigeration and COP. Reversed Carnot cycle – limitations, effect of operating temperatures

Properties of Refrigerants: Classification of Refrigerants Refrigerant nomenclature Desirable properties of Refrigerants – Thermodynamic, Chemical and Physical properties. Alternative Refrigerants to HCFC refrigerants and Future refrigerants.

Aircraft refrigeration System: Analysis of Bell Colemen cycle / reversed Brayton cycle, open and dense air system. Application to aircraft refrigeration, simple cooling system, bootstrap simple evaporative system, regenerative cooling system and reduced ambient cooling system

UNIT – II

Vapor Compression Refrigeration System: Working principle and essential component of a simple vapour compression refrigerator cycle, compressor, condenser, evaporator and expansion devices. Analysis of the cycle, COP, Representation of the cycle on T –S, P– H Charts.

Dry and wet compression, effect of operating conditions like evaporating pressure, condenser pressure, liquid sub cooling and vapour super heating performance of the system.

Applications of VCR system: Domestic Refrigerator and water cooler.

Low temperature refrigeration system (with single load system) – compound compression with water inter cooler and flash inter cooler with single expansion valve. Cascade refrigeration system – analysis, advantages and applications.

UNIT – III

Vapour absorption Refrigeration system: Simple absorption system, COP, practical Ammonia refrigeration absorption system, Lithium Bromide absorption system, Electrolux Refrigerator, common refrigerant and absorbents properties. Comparison with vapour compression refrigeration system.

Working principle, advantages and applications of Steam Jet Refrigeration System, Thermoelectric refrigeration system, pulse tube refrigeration system and solar refrigeration system

Introduction to Cryogenics: Linde system and Claude system, applications of cryogenics.

UNIT –IV

Psychrometry: Psychrometric properties, Psychrometric chart and its construction and representation of Psychrometric processes on the chart – heating & cooling with humidification and dehumidification and adiabatic dehumidification, adiabatic chemical dehumidification and mixing processes, types and working of psychrometers.

Introduction to Air conditioning: Requirement of comfort air conditioning, Thermodynamics of human body, body temperature, metabolism, body defense, effect of heat on performance, ASHRE comfort chart, effective temperature.

UNIT – V

Cooling load calculations for building air conditioning:

Different sources of heat:Heat flow due to conduction,sun load due to direct solar radiation,load from occupants, equipment load, infiltration air load and miscellaneous heat sources,fresh air load, Energy conservation for building air conditioning.

Design of Air conditioning system: All fresh air load, Re circulated air, Re circulated air with Reheat coil and Re circulated air used for heating the air coming out of conditioner.

Concept of by-pass factor, sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF).

Air conditioning systems and Equipments: Window/Split air conditioner, packaged air conditioner and central air conditioning system. Humidifiers, Dehumidifiers, filters, grills fans and blowers.

Note: Use of R&AC tables and charts permitted.

Learning Resources:

1. Stocker W.S., "Refrigeration & Air Conditioning", McGraw-Hill, New Delhi, 2004.
2. Roy J.Dossat, "Principles of Refrigeration-SI Version", Wiley Eastern Limited, New Delhi, 1981.
3. Arora C.P. "Refrigeration and Air Conditioning", Tata McGraw-Hill, New Delhi, 2004
4. Arora S.C. and Domkundwar S., "A course in refrigeration and air conditioning", Dhanpat Rai and sons, 2004.
5. Manohar Prasad., "Refrigeration and Air conditioning", New Age International publishers, New Delhi, 2014

Data Book:

Dr.S.S.Banwait &Dr.S.C.Laroiya., Birla's Properties of Refrigerant &Psychrometric Tables &charts in S.I. Units.

Web resource:
Prof Ramgopal, IIT Kharagpur ., Web and Video material of NPTEL

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE 3/4 - I SEMESTER
ENVIRONMENTAL STUDIES

Instruction :3 Hours /week	Semester End Exam Marks :70	Subject Reference Code : CE 2090
Credits : 3	Sessional Marks: :30	Duration of Semester End Exam :3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are	Upon the completion of this course, students will be able to
• Describe various types of natural resources available on the earth surface. • Explain the concepts, energy flow in ecosystem along with the biotic and abiotic components of various aquatic ecosystems. • Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity. • Explain the causes, effects and control measures of various types of pollutions and environmental protection acts. • Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, various types of disasters and their mitigation measures.	1. Describe the various types of natural resources. 2. Differentiate between various biotic and abiotic components of ecosystem. 3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India. 4. Illustrate causes, effects, control measures of various types of environmental pollutions and environmental protection acts. 5. Explain the causes, effects of climate change, global warming, acid rain and ozone layer depletion, various types of disasters and their mitigation measures and list the methods of water conservation and watershed management.

UNIT-I : **Environmental Studies:** Definition, scope and importance, need for public awareness. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources, growing energy needs, renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT-II : **Ecosystems:** Concepts of an ecosystem, structure and functions of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, oceans, estuaries).

UNIT-III : **Biodiversity:** Genetic species and ecosystem diversity. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV : **Environmental Pollution:** Causes, effects and control measures of air pollution, water pollution, soil pollutions, noise pollution, thermal pollution and solid waste & e-waste management.
Environment Protection Act: Air, water, forest and wild life acts.

UNIT-V : **Social Aspects and the Environment:** Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid, rain, ozone layer depletion. EIA, population explosion.
Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Learning Resources :

Text book:

1. Deswal S. and Deswal A., *A Basic Course on Environmental studies*, Dhanpat Rai & Co Pvt. Ltd. 2004.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2005.

Suggested Reading

1. Suresh K. Dhameja, *Environmental Studies*, S.K. Kataria & Sons, 2010.
2. De A.K., *Environmental Chemistry*, New Age International, 2003.
3. Odum E.P., *Fundamentals of Ecology,* W.B. Sunders Co., USA, 2004.
4. Sharma V.K., *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi, 1999.
5. Rajagopalan R., *Environmental Studies*, Second Edition, Oxford University Press, 2013.

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR BE 3/4 - I SEMESTER
FINISHING SCHOOL-III (TECHNICAL SKILLS)

Instruction :1+1 Hours /week	Semester End Exam Marks :35	Subject Reference Code : ME 3120
Credits : 1	Sessional Marks: :15	Duration of Semester End Exam :1½ Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. **identify** MATLAB as a calculator 2. **apply** MATLAB for solving matrices 3. **formulate** script files and plots using MATLAB 4. **develop** logical statements and 3D plots using MATLAB 5. **examine** solution of differential equations using MATLAB	On completion of this course, students will be able to: 1. **use** MATLAB as a calculator 2. **perform** matrix operations using MATLAB 3. **generate** 2D plots using MATLAB 4. **apply** syntax for logical operations using MATLAB 5. **solve** differential equations using MATLAB

UNIT –I

Starting MATLAB, MATLAB Windows., Working in Command Windows, Working with Arthematic operations with scalars, order of preference, using MATLAB as a calculator, Display of formats, Elementary Math-building functions, Assignment operators, rules about variables, Examples of MATLAB applications, Problems.

UNIT-II

Creating Arrays and matrices, matrix operations, Examples of Applications.

Unit III

Script files, Creating, saving and running a script file, Global variables, input and output commands. 2D plots, Plots with special graphics, Multiple plots, examples. Creating a function file., runnning function file., feval command.., examples and mathematical applications.

Unit IV

Progamming in Mat lab, conditional statements, loops, nested loops, Examples, Polynomials, curve fitting and interpolation, Examples and Applications, 3D plots, line plots, mesh and surface plots, plots with special graphics., view command, Examples.

Unit V

Differentiation and integration, Solving ordinary Equations with one variable, Finding minimum and maximum of a function, Numerical integrtion, solving Ordinary differential equations, Non-linear equations.

Learning Resources:

1. Agam Kumar TyagI, "*MATLAB and Simulink for Engineers*", Oxford Higher Education, 2010
2. Rudra Pratap, " *Getting started with MATLAB*" , Oxford University Press, 2010

3. Amos Gilat, “Matlab – An introduction with applications”, Wiley India, 2012
4. Stevan C Chapra, “Applied Numerical Methods with Matlab for Scientists and Engineers”. Tata McGraw-
Hill, 2010

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

MANUFACTURING PROCESSES LAB

Instruction : 2 Hours /week	Semester End Exam Marks : 50	Subject Reference Code : ME 3011
Credits : 1	Sessional Marks: : 25	Duration of Semester End Exam : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. **design** and manufacturing of sand castings and to study defects of casting. 2. **understand** welding principles, types of weling methods and welding defects. 3. **study** different forming processes	On completion of the course the student will be able to: 1. test sand properties, make gating system and prepare mould for sand casting. 2. join materials using different welding techniques, study of welding properties and defects. 3. manufacture components using drawing, blanking, piercing and injection moulding operations.

Foundry

1. Single piece pattern making with wood as material considering allowances (Draft, Shrinkage and Machining)
2. Green sand mould making processes with complete sprues, gates, riser with design.
3. Testing of green sand properties
4. Melting and casting of aluminum metal and Study of defects in castings by DP test

Welding

1. Identification of different types of flames and making a butt joint with gas welding.
2. Making a lap joint by resistance welding process and strength evaluation.
3. Analysis of bead geometry using AC and DC welding processes.
4. Demo of TIG and MIG welding processes.
5. Exercise on submerged arc welding.

Forming

1. Evaluation of formability using Erichsen cupping test.
2. Design study of simple dies and performing blanking and piercing operations using mechanical/ fly presses and measurement of forces in the operation and comparing with the theoretical loads.
3. Study of simple, compound and progressive dies and making simple components.
4. Evaluation of process variables in injection moulding.

Note: Minimum twelve experiments to be completed.

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 I-SEMESTER

FLUIDS & HYDRAULIC MACHINERY LAB

Instruction : 2 Hours /week	Semester End Exam Marks : 50	Subject Reference Code : ME 3021
Credits : 1	Sessional Marks: : 25	Duration of Semester End Exam : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. provide practical **knowledge** in verification of principles of fluid flow . 2. impart **knowledge** in measuring pressure, discharge and velocity of fluid flow . 3. **understand** frictional losses in pipes . 4. gain **knowledge** in performance testing of Hydraulic Turbines and Hydraulic Pumps .	On completion of the course the student will be able to: 1. **identify** the regims of flow. 2. **utilize** basic measurement techniques of fluid mechanics. 3. **estimate** the frictional losses in pipe flow. 4. **analyse** performance of turbines and pumps at different speeds and heads.

1. Determination of type of flow by Reynolds apparatus.
2. Verification of Bernoulli's Equation for an incompressible flow.
3. Determination of discharge coefficient of venturimeter
4. Determination of discharge coefficient of orificemeter.
5. To study the head loss due to friction in pipe flow and determination of friction factor in pipe flow-Major losses.
6. Performance and characteristics curves of centrifugal pump at different speeds.
7. Performance and characteristics curves of self priming pump.
8. Performance and characteristics curves of reciprocating pump.
9. Performance and characteristics curves of gear pump.
10. Determination of impact coefficient of jet on given vane.
11. Performance and characteristic curves of pelton wheel.
12. Performance and characteristic curves of Francis Turbine.
13. Performance and characteristic curves of Kaplan turbine.
14. Study of Pneumatic circuits.

Note: Minimum twelve experiments to be completed.

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

MACHINE DESIGN

Instruction : 4+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3060
Credits : 4	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: 1. **understand** the concepts of springs and their design. 2. **design** of gears under static and dynamic loads. 3. **design** of sliding and rolling contact bearings. 4. **design** the main components of IC- Engine. 5. **understand** the **concepts** of curved beams.	On completion of the course the student will be able to: 1. **design** helical and leaf springs. 2. **analyse** spur, helical, bevel and worm gears under strength and wear considerations. 3. **select** sliding and rolling contact bearings using Data books. 4. **estimate** the failure of IC engine parts under tortion and bending. 5. **design** of machine frames, crane hook, C-frames and channels.

UNIT – I

Mechanical Springs: Types of springs and Materials used. Design of Helical Springs based on stress, deflection and energy considerations. Concentric springs. Leaf springs: Stresses and deflection. Nipping of leaf springs.

UNIT – II

Gears: Types of gears and materials used. Standards for gear specifications. Design of spur, helical, bevel and worm gears – strength and wear considerations. Types of failure of gear tooth and preventive measures.

UNIT – III

Bearings: Materials used for Bearings, Classification of bearings. Viscosity of Lubricants. Theory of Hydrostatic and Hydrodynamic lubrication. Design of sliding contact bearings – for axial and thrust loads.

Rolling Contact Bearings: Different types of rolling element bearings and their constructional details. Static dynamic load carrying capacity, Load– life relationship, Design for cyclic loads, Selection of bearings using data book.

UNIT– IV

I.C. Engine Parts: Design of piston, connecting rod and crank shafts (single throw and overhang).

UNIT – V

Bending of members with initial curvature – rectangular, circular and trapezoidal sections. Design of crane Hooks, machine frames and C- clamps.

Note: Use of design data book is permitted.

Learning Resources:

1. M.F. Spotts, "Design of Machine Elements", 7th ed., Pearson Edu, 2003
2. V.B. Bhandari, "Machine Design", Tata McGraw–Hill Publications, 2010
3. P.C. Sharma & D.K. Aggarwal, "Machine Design", 10th ed., S.K. Kataria & sons, , 2003
4. J.E. Shigley, C.R. Mischke, "Mechanical Engineering Design", 6th ed., Tata McGraw Hill Publications, 2003.
5. NC Pandya and CS Shah, "Machine Design" Charotar publishing House, 2006

Design Data Book:

S.Md.Jalaludeen, "Design Data Hand book", Anuradha Publications.

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

MECHANICAL VIBRATIONS

Instruction : 4+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3070
Credits : 4	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: 1) **formulate** mathematical models of problems in vibrations using Newton's second law and energy principles. 2) **determine** a complete solution to mechanical vibration problems using mathematical or numerical techniques for 2 D problems. 3) **determine** physical and vibration charecteristics of multi DOF systems. 4) **analyse** the continuous system vibration. 5) **understand** the importance of Vibration testing and testing devices.	On completion of the course, the student will be able to: 1) **construct** the equations of motion and solve for the motion and natural frequency. 2) **construct** the governing differential equation and its solution for a vibrating mass in a 2D system. 3) **solve** for the motion and the natural frequency for vibration of a multi degree of freedom damped or undamped system. 4) **solve** vibration problems that contain continuous systems. 5) **appreciate** the vibration measurement devices and their applications and procedures.

Unit-I

Introduction

Relevance of and need for vibrational analysis – Basics of SHM - Mathematical modelling of vibrating systems - Discrete and continuous systems - single-degree freedom systems - free and forced vibrations, damped and undamped systems.

Unit-II

Two Degree freedom Systems

General solution to free vibration problem - damped free vibration - Forced vibration of undamped system - dynamic vibration absorbers.

Unit-III

Multi Degree freedom Systems

Free and forced vibrations of multi-degree freedom systems in longitudinal, torsional and lateral modes - Matrix methods of solution-normal modes - Orthogonality principle-Energy methods, Eigen values and Eigen vectors

Unit-IV

Continuous Systems

Torsional vibrations - Longitudinal vibration of rods - transverse vibrations of beams - Governing equations of motion - Natural frequencies and normal modes - Energy methods, Introduction to non linear and random vibrations.

Unit-V

Vibration Measurement

Vibration monitoring - data acquistion - Vibration Parameter Selection-Vibration sensors-Accelerometers - Performance characteristics – Sensor mounting - Signal pre-amplification -Types of preamplifiers - Instrumentation - Real time analysis - Digital Fourier transforms - FFT Analysis.

Learning Resources:

1. J.S.Rao and K.Gupta, "Introductory Course on Theory and practice of Mechanical Vibrations ", Wiley Eastern Ltd., 1991.
2. SS Rao, "Mechanical Vibrations ", 5th Ed., Prentice Hall, 2011
3. J.P.Den Hartog, "Mechanical Vibrations ", 4th Edition, McGraw- Hill, New York, 1985.
4. L.Meirovitch, "Elements of vibration Analysis ", 2nd Ed., McGraw-Hill, New York, 1985.
5. W.T. Thomson, M.D..Dahleh, C Padmanabhan, "Theory of Vibration with Applications", 5th Ed., Pearson Education, 2008

Web Resources:

http://www.nptel.ac.in/courses/112103111
http://www.nptel.ac.in/courses/112103112

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

CAD / CAM

Instruction : 3 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3080
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to : 1. **analyze** different types of modelling techniques 2. **learn** different types 2D transformations 3. **understand** different types of Numerical Control machines 4. **learn** parts classification and coding system, process planning and flexible manufacturing system 5. **discuss** GT, CAPP, FMS and CIM	On completion of the course the student will be able to: 1. **compare** the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development. 2. **develop** transformations for 2D geometric modeling. 3. **explain** the basic concepts of CNC machines and their programming. 4. **explain** the importance of group technology, computer aided process planning, flexible manufacturing system. 5. **understand** the latest technologies in computer aided manufacturing.

UNIT – I

Introduction to computer aided design and manufacturing.

Geometric modeling: Wire frame modeling: wire frame entities and their definitions. Interpolation and approximation of curves. Concept of parametric and non–parametric representation of circle and helix curves,

Synthetic Curves: Parametric representation of cubic spline, Bezier and B– spline curves, continuity, properties and characteristics of splines. Concepts of NURBS.

UNIT – II

Surface modeling: Analytical surfaces: Definitions of planar, surface of revolution, Tabulated cylinder. Synthetic surfaces: Cubic and Bezier surfaces.

Solid modeling: C– rep and B– rep and feature instancing approaches.

2D Transformation and their mathematics: Translation, scaling, rotation, shearing and reflection about arbitrary points. Concatenated transformations.

CAD Database and Data exchange: CAD Database and structure, IGES and PDES format.

UNIT – III

Numerical Control of Machine Tools: Features and elements of NC. Positional, paraxial and contouring types. Definitions of axes, Definitions of interpolation, post– processor, preparatory and miscellaneous functions, canned cycles, tool length and cutter radius compensation. CNC programming using G and M codes for simple turning and milling operations.

UNIT –IV

Computer Numerical Control: CNC, DNC and adaptive control systems. Typical configurations and relative features. Machining centers, Introduction to FANUC, SINUMERIC controllers.

Industrial Robots: Robot Anatomy, Configurations, Controls, Drivers, Programming methods and applications.

UNIT – V

Group Technology: Part families, layout, part classification and coding system. Opitz, MICLASSCODE system

Computer Aided Process Planning: Variant and Generative process planning.

Flexible Manufacturing System & Computer Integrated Manufacturing System: Building blocks of Flexible Manufacturing systems and their control, Elements of CIMS. CAD/CAM Integration, Introduction to 3D printing and Reverse Engineering.

Learning Resources:

1. Arvid R. Eide, Roland D. Jenison, Lane H. Mashaw, Larry L. Northup, "Introduction to Engineering Design" McGraw– Hill, 1998.
2. Ibrahim Zeid, "CAD/CAM- Theory and Practice", McGraw-Hill Inc. New York, 2011.
3. Grover, M.P and Zimmers E.W., "CAD/CAM", Prentice Hall of India, 1989.
4. Rao P.N., "CAD/CAM: Principles and Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. Yoram Koren, "Computer Control of Manufacturing Systems", McGraw Hill Inc. New York, 1994

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

MACHINE TOOLS & METAL CUTTING

Instruction : 3 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3090
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: 1. **discuss** construction of various machine tools and their variants. 2. **explain** the working of milling machines and their application to gears and screws. 3. **describe** and understand various non-conventional machining methods and various work holding methods. 4. **understand** the fundamentals of metal cutting with emphasis on tool materials and forces. 5. **analyze** the wear of the tool and its effect on machining, influence of temperature in metal cutting and economics machining.	On completion of the course the student will be able to: 1. understand working of lathe, shaper, milling, grinding, planer, drilling and boring machines. 2. understand various screw and gear manufacturing methods and surface finishing operations. 3. design jigs and fixtures following the principles of location and clamping. 4. select non traditional machining processes for machining a given material. 5. develop relations for chip reduction coefficient, shear angle, shear strain forces, power, specific energy and temperature in orthogonal cutting 6. select cutting fluids, tool materials and coatings to control tool wear and life 7. evaluate cutting speed to minimise production cost and maximise production rate

UNIT-I

MACHINE TOOLS: Constructional features and specifications of machine tools, Kinematic structure of lathe, types of lathes, capstan and turret lathes, Drilling and Boring machines and various operations with applications, tool and work holding devices. Differences between shaper, planer and slotter, Quick return mechanisms.

UNIT-II

MILLING: Fundamentals of Milling operation and types of milling, dividing head and Indexing methods.

SCREWS AND GEAR MANUFACTURING: Tapping, Chasers, Thread rolling, Thread milling, thread grinding, Gear shaping, Gear hobbing, Gear shaving and Grinding.

SURFACE FINISHING: Units of surface finish, types of grinding, Abrasives and bonds used for grinding wheels, specifications and selection of grinding wheels. Broaching, Lapping, Honing, Polishing, Buffing Super finishing and Burnishing.

UNIT-III

JIGS AND FIXTURES: Design principles for location and clamping. Quick clamping devices, Types of Jigs and Fixtures.

NON-TRADITIONAL MACHINING: Principles of working and applications of USM, AJM, EDM, ECM, LBM, and EBM (Mechanism, MRR and process parameters in each case).

UNIT-IV

CUTTING TOOL MATERIALS: High carbon steel, HSS, Stellites, Carbides, Coated carbides, Diamonds. Tools material properties.

TOOL GEOMETRY: Nomenclature of single point cutting tool by ASA and ORS systems. Geometry of drills, milling cutters.

CHIP FORMATION: Types of chips, BUE, chip breakers.

MACHINING: Orthogonal and Oblique cutting, Mechanics of metal cutting, Merchant analysis, Shear angle, Solutions of Merchant and Lee & Shafer.

UNIT-V

THERMAL ASPECTS OF METAL CUTTING: Sources of heat generation and heat distribution, various methods of temperature measurement, Cutting fluids and applications.

TOOL WEAR, TOOL LIFE AND MACHINABILITY: Types of wear, mechanism of tool wear, Tool life and Machinability, Machinability index, Taylor's tool life equation.

ECONOMICS OF MACHINING: Tool life for maximum production, minimum cost.

Learning Resources:

1. B.L. Juneja and Shekon, *"Fundamentals of Metal Cutting & Machines Tools", Wiley* Eastern Ltd., 1987.
2. P.N. Rao, *"Manufacturing Technology – Metal Cutting & Machine Tools",* Vol. 2, Tata McGraw Hill Education Pvt. Ltd, 2010.
3. Amitab Ghosh and Mallick, *"Manufacturing Science",* Affiliated East West Press, 1985.
4. H.S. Shan and P.C. Pandey, *"Modern Machining Process",* Tata McGraw-Hill Education, 1980.
5. A. Bhattacharya, "*Metal Cutting Theory and Practice*" , New Central Book Agency (P) Ltd., Calcutta, 1996

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

HEAT TRANSFER

Instruction : 4+1 Hours /week	Semester End Exam Marks : 70	Subject Reference Code : ME 3100
Credits : 4	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

Course Objectives:	Course Outcomes:
The objectives of this course are to : 1. **make** the students familiar with basic principles of heat transmission by conduction, convection, and radiation. 2. teach students how to **identify, formulate**, and **solve** engineering problems involving conduction, convection, and radiation. 3. teach students how to **apply** energy balances and rate equations to model and **analyze** thermal systems. 4. teach students basic heat exchanger **design** and **evaluation** techniques and principles of boiling and condensation	On completion of the course the student will be able to: 1. **formulate** heat conduction problems in rectangular, cylindrical and spherical coordinate system, by transforming the physical system into a mathematical model. 2. **familiarize** with time dependent heat transfer. 3. **compute** convective heat transfer coefficients in forced convection, natural convection for internal flows & external flows. 4. **understand** radiation heat transfer and can compute radiation heat transfer between black and non-black bodies. 5. **know** the design fundamentals for heat exchangers, which include the LMTD and ε-NTU approaches and to distinguish the mechanisms involved in boiling and condensation.

UNIT – I

INTRODUCTION: Heat Transfer – Different Modes, governing laws and application to heat transfer: Fourier, Newton, Stefan– Boltzmann. General heat conduction equation: derivation in Cartesian, cylindrical and spherical coordinate systems. Steady state one dimensional heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity - through slabs, hollow cylinders and spheres. Steady state one dimensional heat transfer through composite slabs, cylinders and spheres, overall heat transfer coefficient. Concept of thermal resistance in series and parallel. Numerical problems concerned to the above. Critical thickness of insulation: concept, derivation and numerical problems. Thermal contact resistance.

UNIT – II

Extended surfaces or Fins: classification and applications, Heat transfer analysis of fin tips with heat dissipation environment - straight rectangular and circular fins, temperature distribution and heat transfer calculations, fin efficiency and effectiveness. Numerical problems covering all topics. Application of fintheory in temperature measurement.

Transient (Unsteady state) heat conduction: definition, negligible internal thermal resistance, negligible surface resistance, comparable internal thermal and surface resistance – lumped body, infinite body and semi-infinite body.Numerical problems.
Use of Grober and Heislercharts: solutions to various one dimensional problems using charts (Infinite slabs, cylinders and spheres).

UNIT – III
Convection: Dimensional analysis-Buckingham theorem: application of dimensional analysis to forced and free convection problems, Physical significance of different dimensionless numbers.
Boundary layer theory concept - velocity and thermal boundary layers, Application of Von– Karman integral equation for the analysis of thermal boundary layer in forced convection of flat plate. Reynold's analogy for flow over plane surfaces. Free and forced convection - Calculation of heat transfer for laminar flows and turbulent flows over plates, cylinders and spheres. Internal flows through tubes using empirical correlations.

UNIT –IV
Thermal Radiation (Non participating media): fundamental principles – Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien's and Plank's laws, Hemispherical emissive power, Stefan-Boltzmann law for total emissive power of a black body, emissivity and Kirchhoff's laws. Radiation shape factor, shape factor algebra. Total emissive power radiant heat exchange between two gray surfaces. Thermal circuit for radiant heat exchange between infinite parallel plates and between concentric cylinders, enclosures with black and gray surfaces. Numerical problems Radiation shields and re-radiation surfaces.Numerical problems

UNIT – V
Heat Exchangers: Definition, Classification and applications of heat exchangers in industry. Overall heat transfer coefficient. Fouling factors.
Analysis and design of heat exchanger: LMTD method, effectiveness-NTU method.Analytical methods, numerical problems.
Chart solution procedures for solving heat exchanger problems – correction factor charts and effectiveness-NTU charts.
Boiling– pool boiling regimes, nucleate pool boiling, effect of surface wettability on bubble contact angle, Critical heat flux, boiling in forced convection.
Condensation: Film condensation, Drop wise condensation, condensation film thickness, heat transfer coefficient in film condensation.
Note: Use of Data book permitted**.**
Learning Resources:

1. J.P. Holman, "Heat transfer", Tata McGraw Hill Publication, New Delhi, 2010.
2. Sachadeva R.C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International (P) Ltd Publishers, New Delhi, 2010.
3. Rajput R.K., "Heat and Mass Transfer", S. Chand & Company Ltd., New Delhi, 2004.
4. M.Necati Ozisik, "Heat transfer – A basic approach", McGraw-Hill, New York, 2005.
5. Incropera, F.P. and De Witt D.P.- "Fundamentals of Heat and Mass Transfer", John Wiley and sons, New York, 2008.

Data Book:

1. C. P. Kothandaraman, S. Subramanyan "Heat and Mass Transfer Data Book" New Academic Science, 2012, ISBN: 1781830045, 9781781830048

Web Resources:
1. http://nptel.ac.in/courses/112101097/
2. http://freevideolectures.com/Course/2366/Heat-and-Mass-Transfer
3. http://textofvideo.nptel.iitm.ac.in/112101097/

4. http://www.nptelvideos.in/2012/11/heat-transfer.html
5. http://web.mit.edu/lienhard/www/ahtt.html

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

SYLLABUS FOR B.E. 3/4 II-SEMESTER

HUMAN VALUES AND PROFESSIONAL ETHICS-II

Instruction :1 Hour /week	Semester End Exam Marks :70	Subject Reference Code : HS 3140
Credits : 1	Sessional Marks: :30	Duration of Semester End Exam :3 Hours

Course objectives	Course Out comes
The course will enable the students to : • Get a holistic perspective of value- based education. • Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations. • Understand professionalism in harmony with self and society. • Develop ethical human conduct and professional competence. • Enrich their interactions with the world around, both professional and personal.	At the end of this course the student will be able to: • Gain a world view of the self, the society and the profession. • Make informed decisions. • Start exploring themselves in relation to others and their work –constantly evolving into better human beings and professionals • Inculcate Human values into their profession. • Validate their aspirations through right understanding of human relationship and see the co-relation between the human values and prevailing problems. • Strike a balance between physical, mental, emotional and spiritual parts their being. • Obtain a holistic vision about value-based education and professional ethics.

1. **Distinction between need and greed**-Exercising the wisdom to distinguish need from greed.

2. **Rights and Responsibilities**-Educating an individual about rights and responsibilities – Safeguards-Stimulants-Social Justice-The three catalysts for deciding rights and responsibilities.

3. **Imbibing and inculcating Civic Sense and Civic-Virtues**, The true meaning of Integrity - Honesty, Humility, Openness, Transparency, Dedication, Reliability, Confidentiality, accountability, Collegiality, Sympathy, Trustworthiness, Co-operation, Courage.
   The moral dilemma of the Modern world, Respect for Self, Others and Work.
   Respect for women at the workplace.

4. **Ideal self-Real self**- How to define the ideal-idealism at various levels- is it possible to reach idealism –Man as a pilgrim on a journey to idealism.

5. **Managing Failure**-Identifying causes for failure and learning lessons-Using failure to score success-Role of self-confidence and personal ethics in coping with failure.

   - Anger/ Depression
   - Fear
   - Agitation
   - Failure
   - Lethargy
   - Dishonesty
   - Cruelty
   - Jealousy
   - Desire
   - Cheating
   - Pride
   - Greed
   - Lying

6. **Stress Management**- Identifying sources and levels of stress –Tackling stress and its associated negativity-Positive aspect of coping with stress- Some techniques to manage stress.

7. **Developing Emotional Intelligence**
   Self-Awareness
   Handling Emotions
   Motivation

Empathy
Social skills

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
SYLLABUS FOR B.E. 3/4 II-SEMESTER
Finishing School-IV (Soft Skills)

Instruction: 1 +1 Hours / week	Semester End Exam Marks : 35	Subject Reference Code : HS3210
Credits : 1	Sessional Marks : 15	Duration of Semester End Exam : 1½ Hours

Course Objectives	**Course Outcomes**
The objectives of this course are to learn:	At the end of the course student will be able to:
This course aims at enhancing the employability skills. Students will be trained in higher order thinking skills including analytical skills, problem solving skills and critical and logical reasoning skills. Students will be trained to work systematically and develop logical and analytical thinking. Students will be trained in the following areas: 1. Critical and non verbal reasoning 2. Pure mathematics 3. Verbal ability 4. Logical reasoning 5. Data interpretation and analysis	• Understand the fundamentals, concept of aptitude and verbal skills • Solve questions using short cuts and smart methods • Perform calculations with speed and accuracy • Develop analytical thinking and problem solving skills

Unit – I Verbal Ability:
- Finding errors
- Vocabulary
- Synonyms
- Antonyms
- Idioms and phrases
- Fill in the blanks and sentence jumbles
- Reading comprehension

Unit – II Logical Reasoning:
- Logical reasoning
- Assignments
- Puzzles
- Blood relations
- Syllogisms

Unit III Critical and non verbal reasoning
- Critical reasoning
- Non verbal reasoning
- Figure series and completions

Unit –IV Quantitative and aptitude – Pure maths
- Pure maths
- Algebra
- Probability
- Permutations and combinations

Unit – V Data interpretation and analysis
- Data interpretation
- Line graph
- Pie chart
- Bar graph
- Tabulation

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS FOR B.E. 3/4 II-SEMESTER
Finishing School-IV (Technical Skills)

Instruction: 1+1 Hours / week	Semester End Exam Marks : 35	Subject Reference Code : IT2180
Credits : 1	Sessional Marks : 15	Duration of Semester End Exam : 1½ Hours

Course Objectives	**Course Outcomes**
The objectives of this course are to learn:	At the end of the course student will be able to:
1. The course will enable the students to acquire necessary skills to design solution for a given problem.	1. Understand the concepts of basic tokens and evaluation of expressions. 2. Acquire knowledge on different operators, selection and repetition syntaxes with examples and implementation of functions. 3. learn how to use lists, dictionaries and string manipulation. 4. Understand command line arguments, file handling concepts. 5. Acquire Knowledge of object oriented concepts like classes, objects, inheritance and composition.

Unit – I

Introduction to python, comments, variables, operators, mathematical operations, strings and text, format specifiers, printing information.

Unit – II

Command line arguments, prompting users, parameters, packing and unpacking of variables, reading and writing files.

Unit – III

Functions : passing arguments to functions, returning values from functions, functions and files.

Unit – IV

Decision making : if and else if, repetition : while loops, for loops. Lists, iterating a list, operations on list. Dictionaries, operations on dictionaries.

Unit – V

Modules, Classes and Objects, is-a relationship :inheritance , has-a relationship : composition.
Exceptions, Creating a project skeleton, automated testing.

Learning Resources:

1. https://docs.python.org/2/tutorial
2. https://pytho.org

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

DYNAMICS OF MACHINES LAB

Instruction : 2 Hours /week	Semester End Exam Marks : 50	Subject Reference Code : ME 3031
Credits : 1	Sessional Marks: : 25	Duration of Semester End Exam : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. **understand** motion characteristics in CAM and followers. 2. **illustrate** static and dynamic balancing. 3. **apply** gyroscopic effect on vehicles. 4. **understand** vibration response characteristics and stability of dynamic systems.	On completion of the course the student will be able to:: 1. **analyze** the profile of CAM suitable for required motion characteristics. 2. **evaluate** the static and dynamic balancing of masses. 3. **analyze** the gyroscopic effect to stabilize the vehicles. 4. **analyze** the response of dynamic systems under dynamic loading.

1. To study the motion characteristics of the follower with the given profile of the cam.
2. To study the effect of sleeve mass of dead weight type Porter Governor and controlling force curves.
3. To study the effect of varying the spring initial compression acting on sleeve of spring controlled type Hartnell governor and controlling force curves.
4. To study the gyroscopic effect on a disc subjected to precisional motion.
5. To find the static balancing masses in a rotating mass system.
6. To find the dynamic balancing masses in a rotating mass system.
7. To study the un damped forced vibration system
8. To study the damped forced vibration system
9. To study the torsional vibration response characteristics using single rotor system
10. To study the torsional vibration response characteristics using two rotor system.
11. Determination of critical speed of the given shaft with the given end conditions. (Whirling of Shafts)
12. To study frequency response of spring mass system with and without damping.
13. To study frequency response with random excitations (Seismic response).

Note: Minimum twelve experiments to be completed.

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

CAD / CAM LAB

Instruction : 2 Hours /week	Semester End Exam Marks : 50	Subject Reference Code : ME 3041
Credits : 1	Sessional Marks: : 25	Duration of Semester End Exam : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. **practice** 2D and 3D modeling. 2. **practice** assembly of various components. 3. **understand** to write CNC programs.	On completion of the course the student will be able to: 1. **develop** 3D part models. 2. **develop** assembly of given components. 3. **develop** CNC programming for the given simple turning and milling operations.

I. CAD:

1. Practice in the use of some of the packages like: NX (SIEMENS) / CATIA etc., for geometric modelling of simple parts (sketching).
2. Part modelling simple parts using any of the above packages.
3. Developing Assemblies e.g.,
   i. Flange coupling
   ii. Plummer block
   iii. Universal coupling
   iv. Connecting rod

II. CAM:

1. Simulation and development of NC code using any CAM software for Facing and turning, step turning, taper turning, contouring on CNC lathe.
2. Simulation and development of NC code using any CAM software for Pocketing and contouring on CNC milling machine.

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. 3/4 II-SEMESTER

MACHINE TOOLS & METAL CUTTING LAB

Instruction : 2 Hours /week	Semester End Exam Marks : 50	Subject Reference Code : ME 3051
Credits : 1	Sessional Marks: : 25	Duration of Semester End Exam : 3 Hours

Course Objectives	Course Outcomes
The objectives of this course are to : 1. **perform** different jobs on machine tools. 2. **conduct** experiments for evaluation of shear angle. 3. Measurement of cutting forces using dynamometers. 4. indexing of components and grind angles on single point cutting tool. 5. **understand** the working of EDM.	On completion of the course the student will be able to: 1. **operate** various machine tools and plan sequence of operations. 2. **choose** proper machine to get required dimensions with tolerance. 3. **design** the power requirement for a given machine tool. 4. make spur gears **using** milling machine. 5. **analyse** the influence of current on MRR in EDM process.

List of Experiments

1. Exercise with operation of eccentric turning
2. Exercise with operation of thread cutting and boring.
3. Exercise on shaper to make rectangular and 'V' grooves.
4. Cutting spur gear having 20 teeth using simple indexing.
5. Finding shear angle by measuring thickness and length of chips.
6. Measuring the forces by dynamometers and finding friction angle and stress on shear plane and rake plane.
7. Conducting tool life tests and finding the constant and index equation for HSS and carbide tools.
8. Effect of chip-tool by thermocouple method, effect of temprature on cutting speed in turning operation.
9. Grinding of HSS tool using tool and cutter grinder to a given geometry.
10. PCD drilling on radial drilling machine and tapping.
11. Grinding of flat surfaces and measurement of surface finish.
12. Exposure to operations like trepanning, lapping, honing and broaching.
13. Electric Discharge Machining (EDM), experiment to determine MRR Vs Current

Note: Minimum twelve experiments to be completed.